Weapons of Mass Destruction Terrorism Preparedness & Response

Chemical & Biological Arms Control Technologies:

Applications to Homeland Defense

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May 2, 2001

Report Documentation Page

Report Date	Report Type	Dates Covered (from... to)
02May2001	N/A	-

Title and Subtitle Chemical & Biological Arms Control Technologies: Applications to Homeland Defense	**Contract Number**
	Grant Number
	Program Element Number
Author(s) Hoefler, Cathleen	**Project Number**
	Task Number
	Work Unit Number
Performing Organization Name(s) and Address(es) Technology Development (TD)Directorate Chemical and Biological (CB) Arms Control Technology Branch	**Performing Organization Report Number**
Sponsoring/Monitoring Agency Name(s) and Address(es) NDIA (National Defense Industrial Association) 211 Wilson Blvd, STE. 400 Arlington, VA 22201-3061	**Sponsor/Monitor's Acronym(s)**
	Sponsor/Monitor's Report Number(s)
Distribution/Availability Statement Approved for public release, distribution unlimited	
Supplementary Notes Proceedings from the Weapons of Mass Destruction (WMD) Terrorism Preparedness & Response Conference & Exhibition, 30 April - 2 May 2001 Sponsored by NDIA	
Abstract	
Subject Terms	
Report Classification unclassified	**Classification of this page** unclassified
Classification of Abstract unclassified	**Limitation of Abstract** UU
Number of Pages 18	

CW/BW ARMS CONTROL TECHNOLOGY (TDCB) MISSION

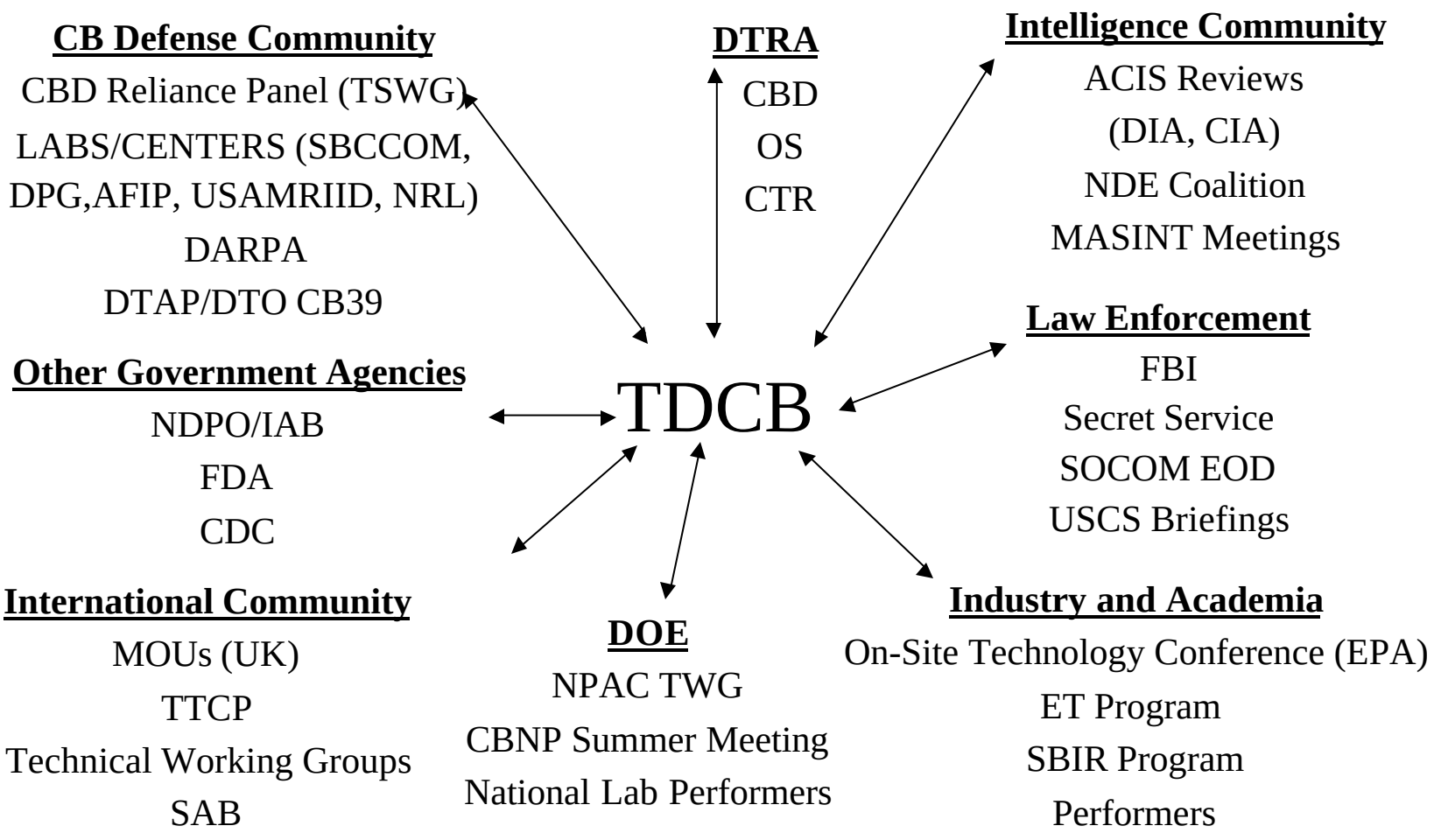
Develop technology needed for DoD activities involving CW and BW arms control & non-proliferation activities, to include implementation, verification, and inspections.

- ✦ Provide technical support and data analysis for arms control negotiations
- ✦ Provide technology capability and support to enable the U. S. Government to protect its rights and comply with arms control agreements

CW/BW ARMS CONTROL TECHNOLOGY MISSION PRIME DIRECTIVE

✦Conduct R&D efforts to enhance data analysis and technology capabilities used during US participation in CW and BW Arms Control and Non-Proliferation activities to not present a threat to DoD equities and national security interests

TECHNOLOGY INTERFACE



COMMON REQUIREMNT CORE

Remote Sensing

Degradation Products

US Escorts

Soils

Forensics

Portable

COUNTER PROLIFERATION

HOMELAND SECURITY

Qualitative

Agents

COTS

WARFIGHTER/ BATTLEFIELD

DETECTION SAMPLING ANALYSIS

INTELLIGENCE MONITORING

On-Site

Aqueous

Emerging Technologies

Compliance

NON-PROLIFERATION ARMS CONTROL

First Responders

Soldiers

Vapor

Covert

Real Time

Point Detection

International Inspectors

DTRA

ARMS CONTROL TECHNOLOGY PROGRAM DRIVERS

Treaty Provisions

Prohibited Items

Matrices

Inspection Type

Time Constraints

Detection Limits

User Requirements

Portability

Size

Operability

Safety

Speed

US Law/Policy

Regulatory Restrictions

Ratification Provisions

Export Control

Trade

*First Responder Technology Drivers

CW and BW TECHNICAL INFORMATION PRODUCTS

- **Objective:** Support OSD Policy and US Delegations with data & analysis. Identify technology gaps

- **Payoff:** Sound technology development, DoD equities protected

- **Challenges:**

CWC: Senate Conditions (restrictions) 4 & 18

BWC: Highly Bracketed Text (no agreement)

"APOTHECARY"

SEARCH:

Data Sources/SARIN/degradation

SEARCH:

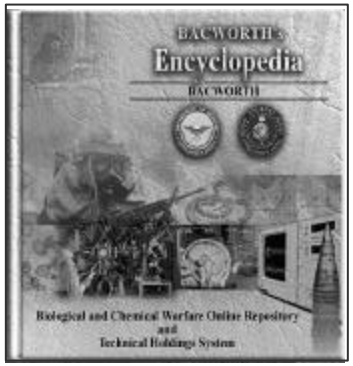
CW Detection/Conductive Polymers

- **Recent Progress/Plans:**

R&D Compendium & Database Web Directory

CWC -Ad Hoc Group- BioMedical Samples

BWC - ABO Encyclopedia



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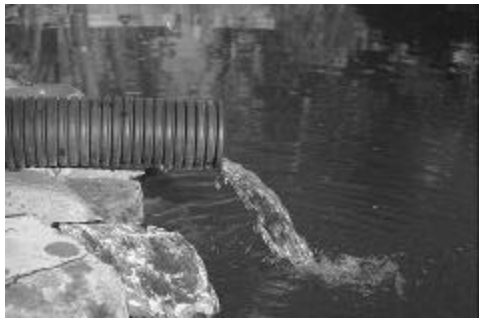
MATRICES/ TARGETS FOR SCREENING



WASTE/DISCHARGE STREAMS

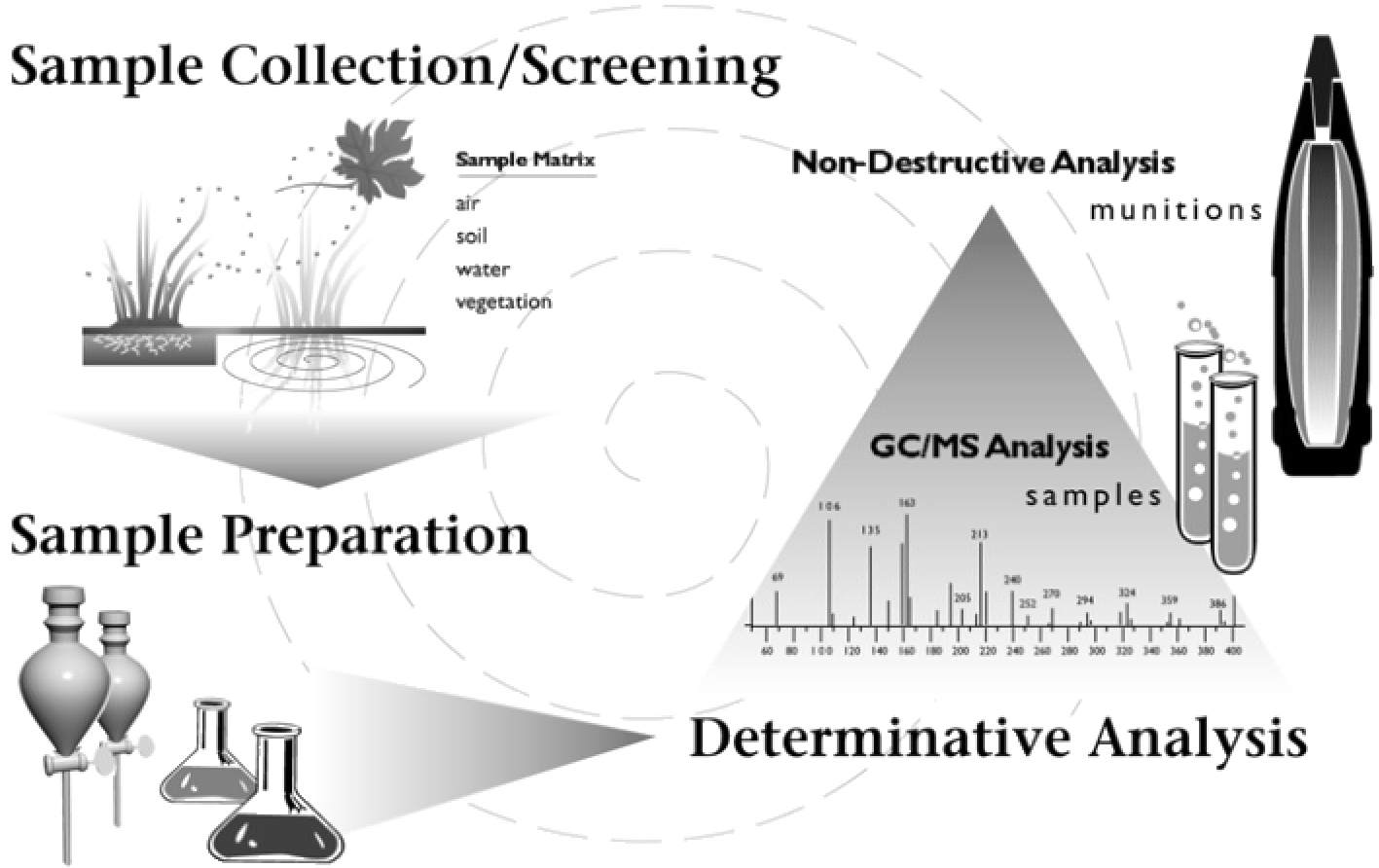
SOILS

AIR/VAPOR

SOLIDS/VEGETATION/WIPES

DTRA

CWC: ON-SITE INSPECTION TECHNOLOGIES



CW SCREENING TECHNOLOGIES

- Photo-Ionization MS - Fragment-Free/Primary Ion-T
- Low Power GC for S/P Detection - T
- Conductive Poly Sensor for Aq Matrices -D
- Conductive Poly Sensor: Air/H-space Screening-D
- Micro-Sensor Using Metal Oxide Coatings-D
- Automated Colorimetric Test Kit-F/D
- Wipe/Swipe Towel Using Colorimetric Enzyme-D
- GC/MIME:Pattern Recognition/Coated Materials-D

D -Development T-Test F -Field

CW SAMPLE COLLECTION & SCREENING Technology Example

Pisces Prototype™

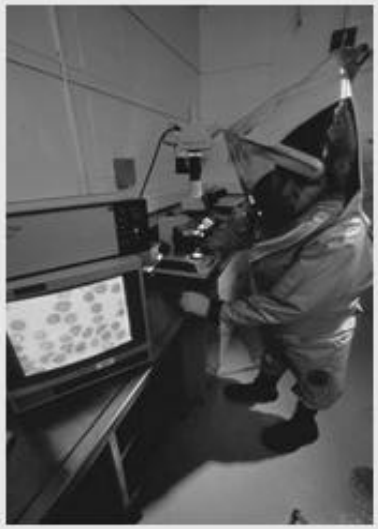
Objective: Meet requirement for rapid portable sample screening

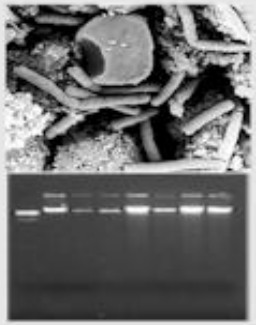
- Matrix: Aqueous Samples
- Automated version of military test kits (M272/M256)
- Uses microfluidics to combine sample with reagents to change color based on presence of nerve agent
- Resulting color formation read by credit-card sized spectrophotometer
- Developer: Constellation Technology Corporation, Largo FL.

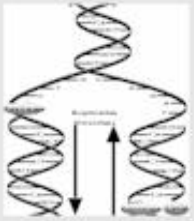
BWC: SAMPLING AND ANALYSIS TECHNOLOGIES

Sample Collection/Screening

Sample Preparation







Confirmatory Analyses

- Immunological
- Genetic (PCR)
- Classical Microbiology

DTRA

BW COLLECTION & SCREENING TECHNOLOGIES

- Hand Held Assay-D/T
- Polymerase Chain Reaction (PCR): Primers/Probes- D/T
- Cellular Function Based Assays-D
- Bacterial Endospore Detector T/D
- Optical Fiber Simultaneous Orthogonal Detection-D
- Magichip-T
- MALDI TOF-D

D-Development T -Testing F-Field

BW SAMPLE SCREENING Technology Example

Objective: Develop rapid, sensitive, and portable system for the simultaneous orthogonal detection of multiple BW agents

- Matrix: Aqueous
- Direct detection and flourescent methods measure captured targets.
- Results down to ng/ml levels for proteinaceous targets
- Developer: Luna Innovations

Long Period Grating (LPG)-Based Optical Fiber Fluorescent Sensor

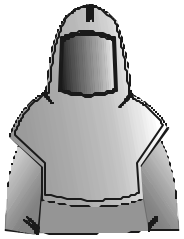
NON-DESTRUCTIVE EVALUATION TECHNOLOGIES

- Swept Frequency Acoustic Interferometry- F
- Advanced Non-Destructive Evaluation -T/D
- Next Generation ANDE-D
- Portable Isotopic Neutron Spectroscopy -F
- Mini-PINS - T/D
- Portable Neutron Generation System -D

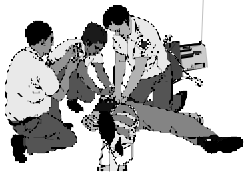
D -Development T - Testing F-Field

MULTIPLE TARGETS FOR NDE

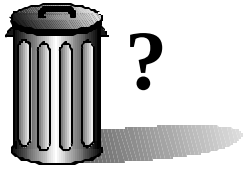
POLITICAL CONVENTIONS



MILITARY FACILITIES



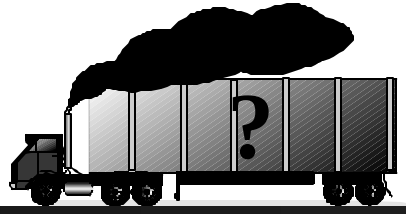
FIRST RESPONSE HAZARDOUS EVENT



INTERNATIONAL SPORTING EVENTS

UN INSPECTED FACILITIES

EXCAVATION SITES



BORDERS & POEs

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NDE TECHNOLOGY
PINS and ANDE SUMMARY

Objective: interrogate & identify sealed container contents rapidly in the field

- CDR for ANDE in June (LANL)
- Prototype Mini-PINS (INEEL)

ANDE: **Stand-off** acoustic based swept frequency interferometry

PINS: Neutron beam molecular identification.

ANDE (URAM)

PINS

GOAL:Approach real-time analysis

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